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## Enhancing Value Chain Activities for Transitioning Towards a Circular Economy Approach: An Applied Study in Al-Ameen Industrial Company in Baghdad, Iraq

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**Abstract:** The research aims to illustrate the integrative relationship between the recycling and closure of the value chain on one hand, and the adoption of a circular economy approach on the other. The study highlights that a circular value chain is one of the key factors for the success of the transition to a circular economy. The shift from a linear economy to a circular economy and the success of its adoption lead to the effective functioning of value chain activities in achieving sustainable value for economic units. The research population consists of government factories at the Vegetable Oils Company, with the research sample being the Al-Ameen Factory, specializing in soap and cleaning products manufacturing.

The primary data collection tools involved financial statement analysis and interviews with production engineers. The analysis focused on cost elements such as raw materials, wages, and indirect industrial costs, with recommendations to reduce these costs based on improving and recycling the value chain activities.

**Key words:** Value Chain, Circular Value Chain, Circular Economy.

### 1. Introduction:

The global economy suffers significantly from losses and wastage associated with production and consumption processes, as well as the accumulation of waste, which is difficult to manage. Additionally, the high costs of recycling or processing waste result in substantial financial losses, while simultaneously posing significant environmental challenges. To address these risks, efforts and initiatives from various fields of expertise are coming together to find solutions for these dangers and waste. Engineering, chemical, economic, and managerial disciplines all collaborate to reach innovative solutions.

In this context, the global economy has undergone significant transformations, accompanied by even greater challenges. A prime example of this is the shift from a linear economy to a circular economy. The goal of any economic transformation is to create added value for stakeholders. To achieve such a transformation, it is necessary to start from the formulation of strategic plans to the detailed aspects included in the execution plans.

Each of these steps requires expertise and skills developed to support the economic transformation, along with the necessary accompanying transformations in other fields like management, accounting, and industry. For the transformation to be built on a solid foundation and proceed along calculated steps to create real value, it is essential to begin with the activities of the value chain, one by one, and attempt to adapt them to align with the new economic approach. This means striving to operate them in a circular manner, ensuring the recycling of resources used at each stage of the value chain. This leads to the creation of a circular value chain rooted in the philosophy of the circular economy, supporting its implementation. All of this will benefit

economic units, particularly those involved in industrial activities, resulting in cost reductions and improved product quality.

This research will be applied to the General Company for Food Products (Al-Ameen Company), which specializes in the production of detergents, by implementing value chain activities after being developed with a circular economy perspective. This will help determine the extent of improvements in product costs and quality levels. Thus, we can achieve an enhanced circular value chain from a circular economy perspective, supporting its activation.

## **2. Methodology**

### **First: Research Problem**

The increasing loss during production processes and the accumulation of waste resulting from consumption processes have led economists to confirm the inefficiency of the linear economy and the necessity of developing a model based on recycling waste and by-products. This includes the development of administrative methods, accounting techniques, and components such as the value chain.

The research question can be formulated as follows:

1. Does improving value chain activities facilitate the transition to a circular economy approach?

### **Second: Research Hypothesis**

The research is based on the following main hypothesis: *"Improving value chain activities facilitates the transition to a circular economy approach."*

### **Third: Research Objectives**

The research aims to achieve the following objectives:

1. To present the theoretical framework of the value chain, its stages of development, and the potential for improving its performance through the circular economy approach.
2. To introduce the circular economy as an advanced philosophical approach and explore its conceptual underpinnings.
3. To verify the possibility of improving value chain activities and adopting a circular value chain in preparation for its application as an approach to transition to the circular economy.

### **Fourth: Research Significance**

The significance of this research lies in its crucial need within the industrial reality of the Iraqi economy. Adopting the circular economy approach will establish comprehensive developmental foundations at both the administrative and accounting levels as a result of economic transformation. This will create an environment conducive to solving the most significant issue in Iraqi industries, particularly in state-owned factories, which is waste, failure to keep up with development, and environmental pollution. All of these transformations will add value to stakeholders along the circular value chain. Properly operating and repeating the circular value chain will form a solid foundation to ensure the smooth adoption of the circular economy.

### **Fifth: Research Population and Sample**

The research population is the industrial sector (General Company for Food Products), one of the largest and oldest industrial companies in Iraq. The company aims to keep up with development and expand its product offerings in response to increasing competition from foreign goods. The company seeks comprehensive expansion due to its significant role in meeting the community's needs, utilizing a wide range of resources that require continuous evaluation to assess the effectiveness and efficiency of their use. Furthermore, the company relies on traditional accounting methods and has not yet seriously adopted modern managerial accounting techniques.

### 3. Value Chain from the Circular Economy Perspective

#### First: The Concept of the Value Chain

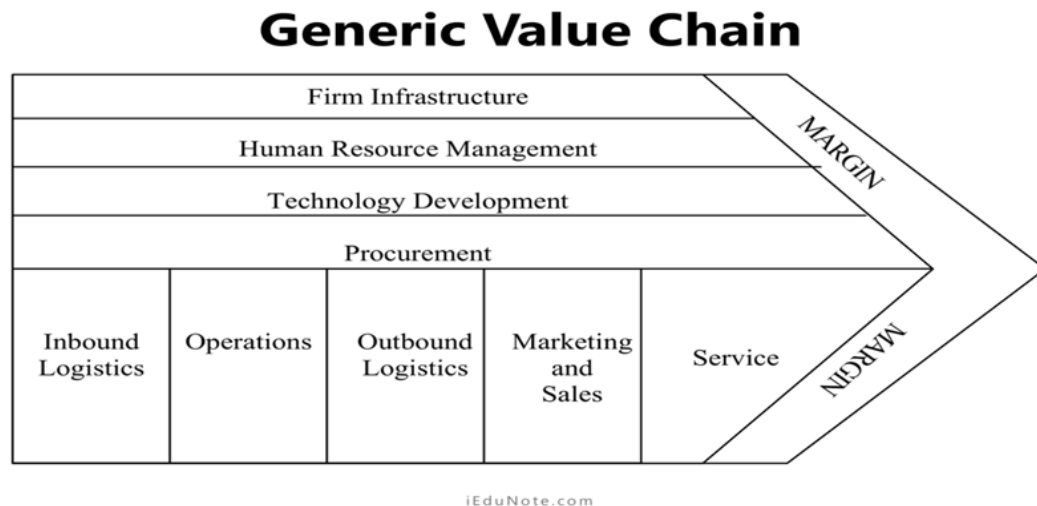
The concept of the value chain first emerged as the coordination and management of supply chain activities, starting from the primary suppliers to production activities, aimed at enhancing production process efficiency and creating added value (Naslund et al., 2012, p. 10). Datar defined it as the sequential arrangement of business functions through which the product becomes more useful, of higher quality, and lower cost. Dubey (2020) described it as a managerial tool aimed at adding value to supply chain activities at all stages to gain a competitive advantage, arranging business functions progressively to make the product more useful, higher quality, and lower cost.

Later, the concept expanded to include environmental concerns. Luzi defined the value chain as the integration and coordination of inbound logistics (suppliers, transportation, raw material storage, and production) with outbound logistics (marketing, distribution, after-sales services, recycling, and addressing environmental issues to reduce total costs) (Luzi et al., 2015, p. 164). In light of the integration of sustainability concepts, it was defined as a series of processes focusing on the optimal use of energy and resources, achieving efficiency and effectiveness between inputs and outputs, as well as eliminating emissions and benefiting from production waste.

In summary, the value chain concept involves a working approach closely linked to environmental management and the overall management system, which includes activities such as planning, responsibilities, practices, procedures, and processes related to developing, applying, reviewing, and maintaining environmental policies. This includes strategies and measures developed to improve environmental and social sustainability and increase competitiveness.

#### Second: Value Chain Activities

Many researchers have discussed the activities within the value chain and categorized them into primary and support activities. The most notable of these is Porter, who adopted this classification, which has since been widely accepted. This division is illustrated in the following figure:



**Figure 1**

*Source: Porter, Michael E., 1998, The Competitive Advantage of Nations, Macmillan Press LTD, London, UK, p. 45.*

#### Primary Activities:

These activities are aimed at creating the product and transforming it from raw materials to the final delivery to the customer, in addition to providing after-sales services. Generally, there are five categories of primary activities that are required in any sector, as shown in the figure. Each activity can be further divided into a set of sub-activities that are relevant to any industry. These primary activities include:

1. **Internal Supplies (Internal Logistics):** These are activities that include receiving inputs, storing them, and distributing them to produce products or services.
2. **Operations:** These refer to processes related to transforming raw materials into finished products or services. This includes design, packaging, assembly, and quality control.
3. **External Supplies (External Logistics):** These are activities involving the collection, storage, and distribution of final products, semi-finished goods, or services to customers. For products, this includes storage, material handling, and transportation. For services, it focuses more on arrangements that ensure customers can access the service location.
4. **Marketing and Sales:** These activities involve providing ways to enhance customer perception of the product or service and encourage them to purchase it. Activities include advertising, sales management, and selecting distribution channels.
5. **After-Sales Services:** These activities aim to enhance or maintain the value of the product or service, offering services such as installation, training, and maintenance.

**Support Activities:** These activities assist in supporting, improving, and enhancing the effectiveness and efficiency of the primary activities. The prevailing support activities can be divided into four categories:

1. **Infrastructure:** This includes the physical assets of the economic unit such as buildings, computers, equipment, furniture, and administrative systems. These infrastructures are critical for the economic unit to perform the primary value chain activities.
2. **Human Resources Management:** The individuals working in the economic unit are a vital resource. The unit manages processes related to recruitment, training, development, incentives, and rewards. Human resource management will permeate through the entire value chain.
3. **Technological Development:** Technology is a crucial source of competitive advantage. Therefore, the economic unit must innovate and develop to reduce costs and protect and sustain competitive advantages. Technological development encompasses a range of activities, including product design, performance improvements for various value chain activities, technical expertise, procedures, and technological inputs for each activity. These activities can be aggregated broadly to improve product quality.
4. **Purchasing:** This refers to a set of activities concerned with providing the material needs for the economic unit efficiently and in various forms, ensuring they flow to production and operation sites in the required quantities, at the right time, and with the required specifications, all while minimizing costs.

After reviewing the literature on the value chain, the main issues it addresses can be summarized into three key areas as follows:

1. **Dynamic Information in the Value Chain:** This begins with input suppliers, through initial production, final consumption, and back again, explaining the comprehensiveness, transparency, and responsiveness of information flows within the chain.
2. **Value Creation and Flow** as perceived by the end consumer at each stage of the value chain.
3. **Nature of Relationships and Trust** between various stakeholders, as well as the nature of communication within the economic unit, and how value created along the chain is shared.

### **Third: Value Chain from Linear to Circular**

The need to adopt the value chain technique is particularly relevant in large economic units that follow mass production systems. These units require advanced production lines to meet demand, even on an international level. Organizing the production process according to value chain stages enables the unit to achieve sufficient flexibility, supporting the economy. As mentioned, the process of closing the value chain, recycling it, and ensuring its integration for a circular economy is closely tied to the coordination of activities among various stakeholders and the management of

material flows within the value chain, which encompasses all economic activities (Brown et al., 2021:263).

It is worth noting that the application of circular value chain activities leads to the unification of operational styles across different geographical locations of economic units, even though policies and standards may vary, to assess the impact of adopting a circular economy. Transitioning from a linear model to a circular model requires starting with the material and technological flow to shift from a linear to a circular value chain. This transition necessitates the development of all value chain activities to form a roadmap for economic transformation, relying on recovery and recycling at all stages of the value chain in five steps as follows:

1. **Developing Processes for the Preparation, Packaging, and Transportation** of raw materials and commodities such as metals, ores, crude oil, natural gas, inks, paints, and other biological resources and intermediates, while using recyclable packaging and pollution-free transport media.
2. **Improving Production Stages, Machinery, and Equipment** by enhancing equipment performance to ensure production process efficiency, selecting fuels with low combustion ratios, and minimizing waste from raw materials and intermediates to reach stages in production that are key to contributing to recycling.
3. **Maintaining the Efficiency of Produced Outputs** by continuously improving design processes to align with value chain recycling goals, adopting standards for the recyclability of final products, and meeting environmental conditions.
4. **Mandating Retailers and Brand Owners** responsible for marketing final products to package and ship products to sales points while adhering to all principles that support the transition from a linear to a circular value chain by designing packaging and transportation materials with recyclability in mind.
5. **Encouraging Stakeholders, Industrial Federations, and Relevant Professional Associations** to engage in creating industries specialized in recycling, offering financial and institutional support to provide all facilities that make this industry a foundation for a circular value chain and a key step towards transforming the economy to a circular model.

#### **Fourth: The Concept of the Circular Economy**

The circular economy has become one of the trends that has gained significant attention from both academic and professional communities. It is a crucial element in sustainability, focusing on business activities and industries that rely on recycling and renewable energy (Gupta et al., 2019: 478). The circular economy asserts that business models should go far beyond the traditional linear economy based on production, consumption, and waste disposal, transitioning to a model centred on recycling and reuse. The circular economy is a way to preserve resources and improve their usage. It represents a new concept of more sustainable development, aiming to increase resource efficiency to achieve economic, environmental, and social development by balancing economic, environmental, technological, and social factors. Companies wishing to adopt a circular model must move towards technologies and business models that emphasize longevity, the ability to regenerate, reuse, and repair in order to improve the ways existing resources and materials are exploited, reducing raw material consumption and related waste (Dewulf, 2019: 547).

At the level of the economic unit, the circular economy means adopting cleaner production and distribution patterns, particularly through the introduction of better technologies. This leads to the adoption of new business models that require a broader, more comprehensive view to design alternative, radical solutions, network relationships, and involve individuals throughout the life cycle of any process, as well as fundamental changes in practices. Therefore, the circular economy is a key element in sustainable development that can provide companies with a competitive advantage, as it allows them to redesign and reorganize their processes (including manufacturing, by reducing resource inputs, waste, and emissions). To achieve this goal, economic units must be

organized in a way that allows their operations to benefit from circular economy principles, resource exchange, and interactions. Thus, the circular economy can be defined at the level of the economic unit as the power to extend the life cycle of resources, i.e., to lengthen the period during which materials are used (Ghibelline et al., 2016: 17).

#### **Fifth: Mechanisms for Transitioning to a Circular Economy**

The circular economy relies on the idea of striving to achieve the highest possible efficiency in resource usage. This can be achieved through three main mechanisms as follows (Bocken et al., 2016: 308):

1. **Closing Resource Loops:** This refers to replacing new raw materials with secondary materials by using recycled components, reused goods, or repairing and remanufacturing products.
2. **Slowing Resource Loops:** This mechanism involves slowing the resource loops by extending the product's life span through enhancing its durability.
3. **Narrowing Resource Flows:** This approach aims to narrow resource flows by using natural resources more efficiently, optimizing the use of materials and final products through higher reliance on technology in handling products and relying on renewable energy sources for operations.

#### **Sixth: Drivers of the Circular Economy**

The industrial revolution led to the creation of a production system that results in billions of tons of toxic materials being released into water, air, and soil, leading to the destruction of ecosystems and a reduction in biodiversity. The circular economy emerged as a solution to this problem, working similarly to natural ecosystems with some changes. In the circular economy, almost no waste is produced, making it the most effective way to preserve resources and materials while ensuring continuous economic growth. Based on this, there are three main drivers of the circular economy:

1. **Resource Scarcity:** The global demand for resources is rapidly increasing, leading to a growing shortage of essential raw materials and water, facing risks in securing raw materials and difficulties in providing new resources.
2. **Technological Development:** This refers to the introduction of new technologies, where new business models can be developed and introduced in the circular economy. New technologies and innovative approaches can be developed at various stages of manufacturing and consumption, adopting recycling and reuse of resources, and applying information technology across the value chain from product to consumer.
3. **Social and Economic Development:** The circular economy model plays a vital role in the context of urbanization, as urban areas can develop more easily through the implementation and maintenance of systems that produce a variety of goods, materials, and other resources, which will be effective in reducing costs.

#### **Seventh: The Impact of the Circular Economy on Institutional Capital**

The circular economy focuses on three types of resources: natural, manufactured, and financial capital. Because the circular economy relies on recycling economic resources to maintain value, reduce costs, and increase profits, economic units also utilize many other resources that are recognized and assessed based on the concept of capital as any resource capable of producing other resources (Flora, 2004). Economic units can evaluate their stock, including surplus and deficit, as well as the enhancement required for different types of capital. There are several types of capital in this regard, including digital capital, information infrastructure, and the data necessary for the successful operation of any economic activity today. Additionally, human and social capital refers to enhancing the knowledge and organizational skills of individuals, allowing economic units to access resources they do not own. Political capital and relationships with the political institution reflect its influence on decision-making within economic units. Cultural capital

refers to the cultural values governing individuals at different administrative levels within the economic unit (Nogueira et al., 2020).

Dividing capital into various forms allows economic units to have a more comprehensive understanding of how their use of different resources contributes to achieving the goals of the circular economy. Researchers can develop both quantitative and qualitative methods to assess how economic units contribute to depleting and renewing various capital stocks through these activities (Rockström et al., 2009).

#### **Eighth: The Role of the Value Chain in Supporting the Transition to the Circular Economy**

Different economic systems need to take thoughtful steps to transition to a circular economy. This requires fundamentally restructuring economic activities along the value chain. Individual economic units alone cannot achieve these changes; rather, cooperation among stakeholders along the value chain is required. However, such collaborative efforts often face significant challenges. Stakeholders may have different perceptions of the transition to a circular economy because it involves a great deal of uncertainty and presents challenges for economic units unable to make this transition. A shared understanding of the concept of the circular economy, including its goals and measurement systems, is still lacking (Korhonen et al., 2018: 549).

Furthermore, there is a need for a fundamental restructuring of economic activities along the value chain to allow for continuous reuse and recycling. This restructuring is linked to fundamental changes in production and consumption patterns, including the development of new products, services, processes, and technologies, as well as the development of new business models (Dewulf, 2019: 547).

Given the relatively recent adoption of this concept in the business world, the success of different methods remains uncertain. Therefore, managers need to consider various potential methods for applying the circular concept to their operations. Since the transition to a circular system revolves around changing material flows across the economy, it is difficult for individual economic actors to understand and assess the feasibility of specific solutions and changes required, from material production to recycling. These changes often extend to a wide range of economic activities carried out by various actors whose activities depend on each other. To transition from a linear model to a circular one, managers must actively engage with other stakeholders to interpret what circularity truly means and identify its tangible effects on their economic units (Brown et al., 2021: 268).

#### **4. Practical Aspect: Improving the Value Chain as an Entry to the Circular Economy.**

##### **First: An Overview of the Company in the Study Sample**

The General Company for Food Products in Iraq is one of the largest and oldest industrial companies in the country. The company strives to keep pace with development and expansion by launching new products to meet the increasing competition from foreign goods. The company follows an inclusive expansion strategy, which reflects the progress witnessed by the General Company for Food Products through expanding and improving its products.

The General Company for Food Products in Iraq was established in 2016 following the merger of the following companies:

- ✓ The General Company for Vegetable Oil Industry (1970)
- ✓ The General Company for Dairy Products (1998)
- ✓ The General Company for Sugar Industry (1998)
- ✓ The General Company for Tobacco and Cigarettes (1998)

The company's headquarters is located in Baghdad Governorate, Al-Karada, Al-Masbah Street. It is one of the affiliates of the Ministry of Industry and Minerals and specializes in the production of solid fats, liquid oils, soaps, detergents of all types, cosmetics, dairy products and their derivatives, various types of sugar, by-products, and complementary products, as well as tobacco and

cigarettes. The General Company for Food Products is a self-financed economic production unit fully owned by the state. It enjoys legal personality and financial and administrative independence, operating according to economic principles and is affiliated with the Ministry of Industry and Minerals. Its headquarters is located in Baghdad, with branches both within Iraq and abroad.

The company’s capital amounts to 8,601,593,000 Iraqi Dinars (eight billion six hundred one million five hundred ninety-three thousand Dinars).

The organizational structure of the factory is one of the key elements contributing to its success and achieving its goals. It defines the functions, responsibilities, and relationships between employees and managers, ensuring the smooth and efficient operation of the workflow.

The Al-Ameen Factory operates eight production lines, each producing different cleaning products. Focus will be placed on the soap production line due to its superior financial performance compared to the other production lines. This will be analysed and studied in the following sections.

**Second: Evaluation of Al-Ameen Factory Costs for the Fiscal Year 2022**

**1. Evaluation of Total Costs for Al-Ameen Factory for the Fiscal Year 2022**

In this step, the total costs of Al-Ameen Factory will be determined as reported in the factory’s records according to the unified accounting system for the year 2022. The importance of each cost item relative to the others will be assessed, and the growth rate of expenses compared to the previous year will be determined and justified. (Amounts are in thousands of Dinars).

**Table No. (1):** Total costs for the year 2022

Account Number	Account Name	2022	Relative Importance	Growth Rate
311	Employee Cash Salaries	6,882,443	70%	-2%
312	Social Security Contribution	669,257	0.86%	-5%
31	Total Salaries	7,551,700	77%	-2%
321	Raw Materials	343,455	0.35%	55%
322	Fuel and Oils	241,481	0.25%	18%
323	Spare Parts	105,670	0.18%	32%
324	Packing Materials	105,551	0.17%	22%
325	Miscellaneous	23,088	0.02%	27%
326	Employee Equipment	6,373	0.007%	17%
327	Water and Electricity	42,592	0.04%	20%
32	Goods Supplies	1,344,471	13%	65%
331	Maintenance Services	140,581	0.14%	19%
332	Research and Consulting Services	1,980	0.002%	36%
333	Advertising, Printing, and Hospitality	16,389	0.016%	7%
334	Transport, Delegation, and Communications	195,795	2%	8%
335	Rent of Fixed Assets	3,641	0.003%	19%
336	Service Expenses	81,354	0.08%	86%
33	Service Supplies	400,740	0.4%	-2%
37	Depreciation	396,808	0.4%	2%
38	Transfer Expenses	37,314	0.03%	66%
39	Other Expenses	3,910	0.0004%	31%
Total Expenses		9,770,139		4%

*Source: Prepared by the researcher based on company data*

From the table above, regarding the relative importance, the following observations can be made:



- The relative importance of salaries and social security expenses is high, accounting for 77% of total expenses. This indicates an underutilization of working hours and the presence of significant deviations in time efficiency.
- The relative importance of material supplies is 13%, which is considered high compared to other expense categories, except for salaries and social security. This is due to increased consumption of raw materials resulting from continuous attempts to increase production, accompanied by material waste and the lack of adoption of modern efficiency practices, such as sustainability and circular economy.
- The remaining expense items have similar relative importance, and therefore, the focus will be on reducing salary and material supply expenses in the practical section.
- As for the growth rates of the various expense items, the following trends are observed:
  - A decrease in salary expenses across all years, attributed to the increase in the retirement rate of employees, with the number of employees decreasing by 22 in 2022.
  - An increase in material supply expenses across all years, due to higher purchases of raw materials, spare parts, and packaging materials, rising by 55% in 2022.
  - A decrease in service expenses by 2%, mainly due to a 19% reduction in maintenance costs in 2022.
- The overall result was a 4% increase in total factory expenses for 2022.

**2. Comparison of Actual Production to Actual Sales**

In this step, actual sales will be determined and compared to actual production, with the deviations in quantities (measured in tons) identified.

**Table No. (2):** Comparison of Sales with Production

No.	Soap Type	Actual Sales (Tons)	Actual Production (Tons)	Deviation (Tons)
1	Laundry Soap	1354.856	25.55	+109.31
2	Olive Soap	24.36	50	-25.64
3	Toilet Soap	62.91	20	+42.91
4	Liquid Soap	9.027	15.98	-6.96

*Source: Prepared by the researcher based on company data*

When analysing the data presented above, which compares the production level of the company (i.e., what was produced from each product in 2022) with the actual sales according to the income statements and trial balance, a significant difference was found between the planned and actual sales for laundry soap. The deviation amounted to 109.31 tons, which is higher than the planned sales.

Following this, toilet soap showed a noticeable deviation of 42.91 tons, with actual sales higher than the planned amount. This increase indicates poor management planning and its inability to forecast local market needs accurately. On the other hand, it reflects a large inventory level that managed to bridge the gap between what was produced and what was sold, highlighting high storage and inventory costs that could have been avoided had the company adopted a circular economy approach to streamline its value chain activities.

Regarding olive soap, actual sales were 25.64 tons lower than planned, and liquid soap also had lower sales than planned by 6.96 tons. This confirms the earlier observation of a lack of structured planning to determine actual market needs and address them. This oversight led to an excess in production, forcing the company to bear additional inventory costs, while also causing shortages and an inability to meet consumer market demands.

### 3. Evaluation of Worker Productivity and Labor Cost Reduction

After conducting field visits and personal interviews with department heads in the company, the total number of workers, which is 280, was determined, along with how they are distributed across the products manufactured by the company. The details are as follows:

**Table No. (3):** Distribution of Workers and Wages Across Production Departments.

No.	Soap Type	Number of Workers	Actual Wages (IQD)
1	Laundry Soap	84	2,064,732,852
2	Olive Soap	56	1,376,488,568
3	Toilet Soap	18	422,422,754
4	Liquid Soap	46	1,130,687,038
5	General Management	76	1,868,091,628

**Source:** Prepared by the researcher based on company data

After determining the actual direct wages of the workers distributed according to their production departments by dividing the total wages by the number of workers to reach the hourly wage for each worker in various departments, and calculating the direct wages for each department, the following calculations were made:

Annual Average Wage per Worker

Annual Average Wage per Worker = Total Wages / Number of Workers

Annual Average Wage per Worker = 6,882,443,000 IQD / 280 Workers  
 = 24,580,153 IQD approximately as the average annual wage per worker.

Standard Working Time per Worker Annually

Standard Working Time per Worker Annually = Days in the Year – (Fridays, Saturdays, and Official Holidays)

= 365 Days – (12 Months × 4 Weeks × 2 Days + 14)

= 255 Actual Workdays × 7 Hours

= 1,785 Hours of Work per Worker Annually

Average Hourly Wage

Average Hourly Wage = Annual Average Wage per Worker / Annual Work Hours

= 24,580,153 IQD / 1,785 Hours

= 13,770 IQD per Hour

After adjusting and improvements to the value chain activities following the circular economy approach—such as reducing handling and setup times, focusing on enhancing workers' skills in using machinery, and developing advanced incentive plans—the cost accountants at Al-Ameen Factory managed to reduce the standard hourly wage to 12,000 IQD per hour as a direct wage.

Thus, the reduction in direct wages can be calculated by determining the new wages for each department using the following formula:

(12,000 IQD/Hour × 1,785 Hours per Worker Annually × Number of Workers in the Department)

Then, a comparison with the actual wages before the reduction is made, as shown below:

**Table No. (4):** Determining the Amount of Savings in Direct Wages

No.	Soap Type	Wages After Reduction (IQD)	Wages Before Reduction (IQD)	Amount of Reduction (IQD)
1	Laundry Soap	1,799,280,000	2,064,732,852	265,452,852
2	Olive Soap	1,199,520,000	1,376,488,568	176,968,568
3	Toilet Soap	385,560,000	422,422,754	36,862,754
4	Liquid Soap	985,320,000	1,130,687,038	145,367,038
5	General Management	1,627,920,000	1,868,091,628	240,171,628
<b>6</b>	<b>Total Savings</b>	-	-	<b>3,025,822,840</b>

Source: Prepared by the researcher based on company data

After the reduction in the hourly wage through improvements made to the value chain activities following the circular economy approach, which alleviated the efforts of the workers and enabled the company to reduce the hourly wage by 1,770 IQD for each direct work hour, this simple reduction led to an overall decrease in salaries and wages across the factory by 34%.

#### 4. Evaluation of Indirect Costs

To reduce indirect costs effectively within the value chain activities according to the circular economy approach, the proportion of energy utilized from the planned energy will be adopted. This allows for the exclusion of indirect costs that do not add value. Then, the indirect costs for the four soap production lines will be assessed and reduced according to the unused energy percentage, as shown below:

**Table No. (5):** Planned Energy and Utilized Energy

Type of Soap	Planned Energy (tons)	Utilized Energy (tons)	Utilization Rate (%)
Laundry Soap	1,500	1,350	90.00%
Laurel Soap	1,250	1,027	82.16%
Toilet Soap	4,200	2,830	67.40%
Liquid Soap	1,750	1,000	57.00%

Source: Prepared by the researcher based on company data.

After determining the utilized energy percentage, the complement of the utilization rate—representing the idle energy percentage—will be applied to the indirect costs. This will help identify the portion of indirect costs associated with idle energy that does not add value. The calculation is as follows:

$$\text{Idle Energy Percentage} = 100\% - \text{Utilization Rate (\%)}$$

$$\text{Idle Indirect Costs} = \text{Indirect Costs} \times \text{Idle Energy Percentage}$$

This approach ensures a clear identification of non-value-adding costs, providing insights for potential cost reduction and efficiency improvements.

**Table (6):** Reduction of Indirect Costs

Type of Soap	Indirect Costs (IQD)	Idle Energy (%)	Reduction Amount (IQD)
Laundry Soap	43,389,000	10%	4,338,900
Laurel Soap	51,149,000	17.84%	9,124,982
Toilet Soap	25,709,000	32.6%	8,381,134
Liquid Soap	38,430,000	43%	16,524,900
	<b>158,677,000</b>		<b>38,369,916</b>

Source: Prepared by the researcher based on company data.

After excluding idle indirect costs, which accounted for 24%, it is evident that this percentage does not add value or generate returns for the Amin Factory within its soap production lines.

### **Third: Proposed Approaches to Enhance Value Chain Stages Through the Circular Economy Framework**

Following an analysis of the total costs for the Amin Factory (research sample) and identifying potential reductions in direct wages and indirect industrial costs, this section highlights the stages and activities of the value chain and explores their potential recycling in the context of the circular economy, as follows:

#### **1. Recycling Activities in the Research and Development (R&D) Stage**

This stage serves as the cornerstone for guiding the economic unit by recycling the activities and detailed processes branching from it, as detailed below:

- Promoting a culture of recycling across all segments of economic units and embedding it as a core ethical belief among human resources at various administrative and production levels.
- Emphasizing contemporary industrial fields characterized by high-quality standards and long-lasting, high-performance products.
- Enhancing current industries by seeking recyclable alternatives, whether in raw materials or secondary materials added during various manufacturing phases.
- Leveraging modern expertise and skills that adopt advanced R&D methods to develop sustainable, eco-friendly designs utilizing recyclable materials.

#### **2. Recycling Activities in the Design Stage**

This stage reflects the outcomes of R&D, laying the groundwork for designing sustainable, recyclable products using recycled raw materials and production methods, as follows:

- Designing eco-friendly soaps tailored to customer preferences in terms of shape and specifications, while ensuring recyclability.
- Addressing waste and losses in the design process by preparing optimized designs for reuse, reshaping, or incorporating them as parts of other products.
- Utilizing manufacturing by-products, such as fatty residues, for producing liquid soaps for cleaning utensils and glass surfaces, thus avoiding the use of new raw materials.
- Designing sustainable packaging, including bottles, caps, and cartons, using recyclable materials.

#### **3. Recycling Activities in the Manufacturing Stage**

This critical stage translates the efforts of the previous stages into action and forms the foundation for recycling subsequent stages. Proposed initiatives include:

- Improving the quality of raw materials used in soap production, whether primary (e.g., oils and fats) or auxiliary (e.g., salts and fragrances), as detailed in Table 6, Section 1.
- Incorporating organic materials in the milling stage, adding shells, and replacing preservatives with materials that facilitate easy decomposition and environmental integration post-use, as detailed in Table 6, Section 1.
- Adding chemical compounds and salts to mitigate the negative effects of soap residues on wastewater.
- Adopting the **Just-In-Time (JIT)** philosophy to reduce high storage costs, including space, electricity, human resource wages, and handling costs, as detailed in Table 6, Section 4.

- Introducing machinery improvements, such as reducing fuel consumption and electricity usage by replacing oil types used in machines, leading to a reduction in burn rates by approximately 9 minutes per hour, as detailed in Table 6, Sections 2 and 3.
- Decommissioning idle machinery identified during field visits to the production site and excluding them from the allocation of spare parts, as detailed in Table 6, Sections 2 and 3.
- Achieving notable reductions in material requirements by replacing synthetic dyes and fragrances with materials fermented from previous production orders for subsequent use, as detailed in Table 6, Section 5.

**Table (6): Manufacturing Cost Reductions (Amounts in Thousands)**

Account Name	Reason for Reduction	Pre-Reduction Amount	Reduction Amount	Reduction Percentage
Raw Materials	Material Improvement	343,455,000	21,637,665	6.3%
Fuels and Oils	Replacement of Type	241,481,000	19,318,480	8%
Spare Parts	Decommissioning Machines	105,670,000	13,420,090	12.7%
Fixed Asset Rentals	Elimination of Storage Costs	3,641,000	2,985,620	82%
Commodity Supplies	Manufacturing Alternatives	1,344,471,000	174,781,230	13%

**Source:** Prepared by the researcher based on company data.

#### 4. Recycling Activities in the Marketing Stage

This stage builds upon the improvements made in the manufacturing stage by addressing similar cost elements. Enhancements and recycling of marketing activities can be achieved as follows:

##### ➤ Revisiting Packaging Materials:

Focus on identifying eco-friendly, biodegradable alternatives with minimal health risks, such as paper-based raw materials, while significantly reducing plastic use. This approach benefits from the lower cost of paper-based materials and their biodegradable nature, as illustrated in Table (7), Section 1.

##### ➤ Enhancing Printing Efficiency:

After improving the raw materials used for packaging, existing machinery can be modified slightly to enable printing the company logo and product details directly onto the packaging in a bold, colourful format. This eliminates the need for separate printed labels or stickers, thereby significantly reducing printing costs. Advertising costs can also be reduced by shifting to social media platforms, websites, and maintainable digital billboards instead of paper-based posters and non-recyclable banners, as shown in Table (7), Section 2.

##### ➤ Replacing International Travel and Communication Costs:

Transitioning to electronic communication with external stakeholders to foster skill development among marketing teams can minimize expenses related to travel, accommodation, and international calls, as detailed in Table (7), Section 3.

**Table (7):** Marketing Cost Reductions (Amounts in Thousands)

Account Name	Reason for Reduction	Pre-Reduction Amount	Reduction Amount	Reduction Percentage
Packaging Materials	Manufacturing instead of purchasing	105,551,000	3,166,530	3%
Advertising, Printing, and Hospitality	Development	16,389,000	13,602,870	83%
Transportation, Travel, and Communications	Electronic communication	195,795,000	42,291,720	21.6%

**Source:** Prepared by the researcher based on company data.

## 5. Recycling in the After-Sales Service Stage

Based on discussions with the engineering team at the company, it was discovered that recycling is already actively applied in the factory's after-sales services. Products that are returned due to complete damage are recycled by being reprocessed and reformed or used as raw materials for other products. For the products that suffer from damaged packaging and materials without affecting the final product, they are re-packaged and displayed for sale again.

## Conclusions and Recommendations

### Conclusions

1. **The Value Chain Concept** involves a methodology that is directly linked to environmental management and the overall management system. This system encompasses activities related to planning, responsibilities, practices, procedures, processes, and resources aimed at developing, applying, reviewing, and maintaining environmental policies through a range of activities.
2. Global demand for resources is increasing rapidly, leading to growing shortages in basic raw materials and water, alongside the risks associated with securing raw materials and the challenges in providing new resources.
3. Economic units should move beyond the traditional linear economy model based on production, consumption, and waste disposal. They should transition to a model focused on recycling and reuse.

### Recommendations

1. The shift from a linear economy to a circular economy model requires beginning with the physical and technological flow to move from the linear value chain to the circular one. This transition requires the development of all activities in the value chain, serving as a roadmap for economic transformation based on recovery and recycling at every stage of the value chain.
2. Implementing circular value chain activities helps standardize the operational methods of economic units across various geographic locations, despite differing policies and standards, thus verifying the impact of adopting the circular economy.
3. Economic units should replace new raw materials with secondary materials by using recycled components, used goods, or repairing and remanufacturing products. They should aim to slow down resource cycles by extending the product lifecycle through enhanced durability.

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